A Vacuum Aspirated Cryo Cooling System (VACCS)

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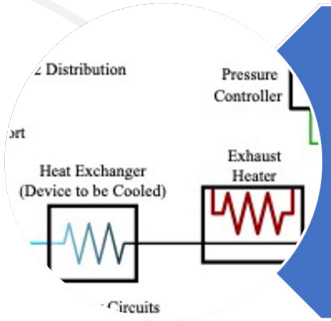
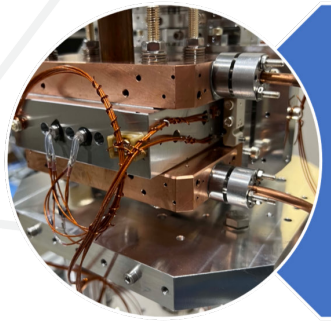
8th November 2023

Outline



Design

VACCS on VMXm



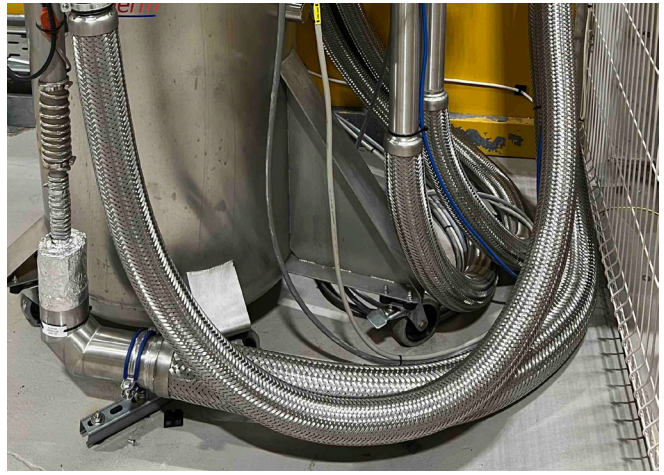
Monochromator Test Rig

Why?

- Cryo-Cooling
  - Scientific goals
  - Optics

Why?

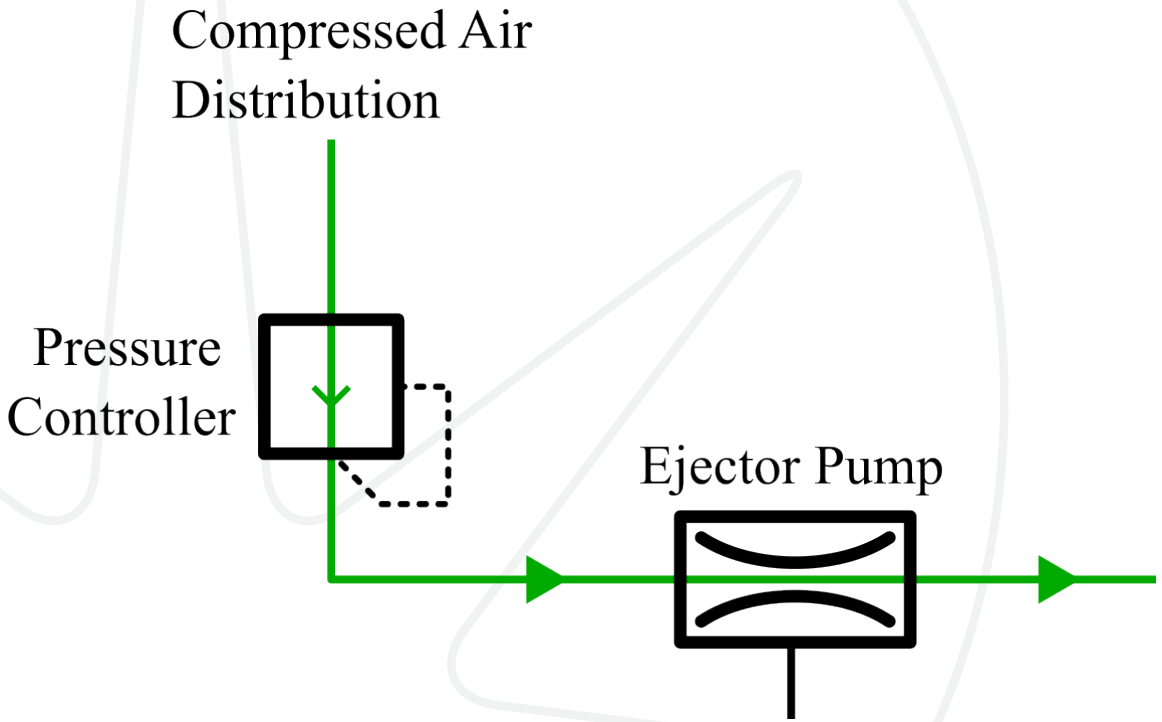
- Cryo-Cooling
  - Scientific goals
  - Optics
- Cryocoolers
  - Expensive $$$
  - Substantial footprint
  - High stiffness distribution lines
  - High cooling power - Typically 2-3 kW

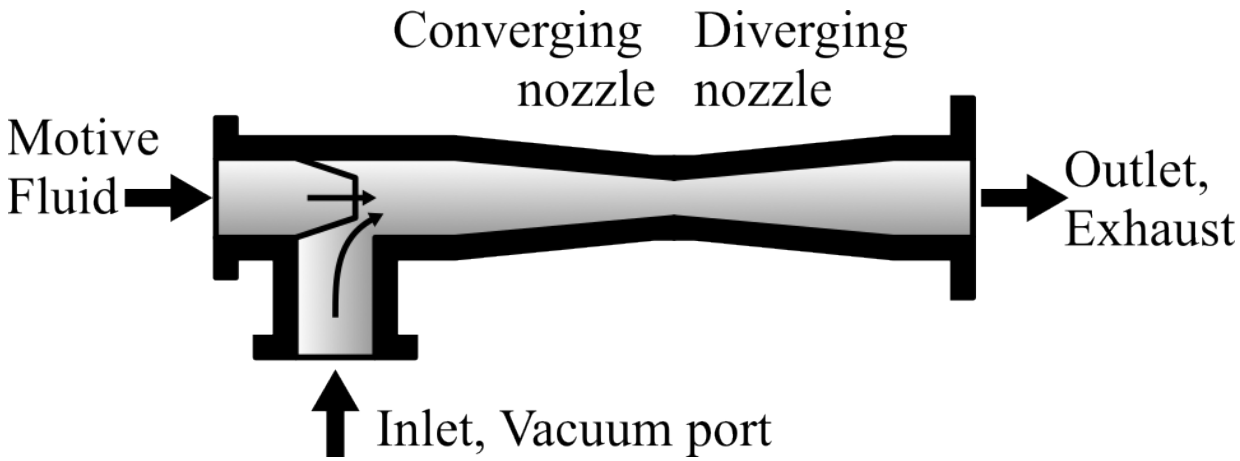


Design

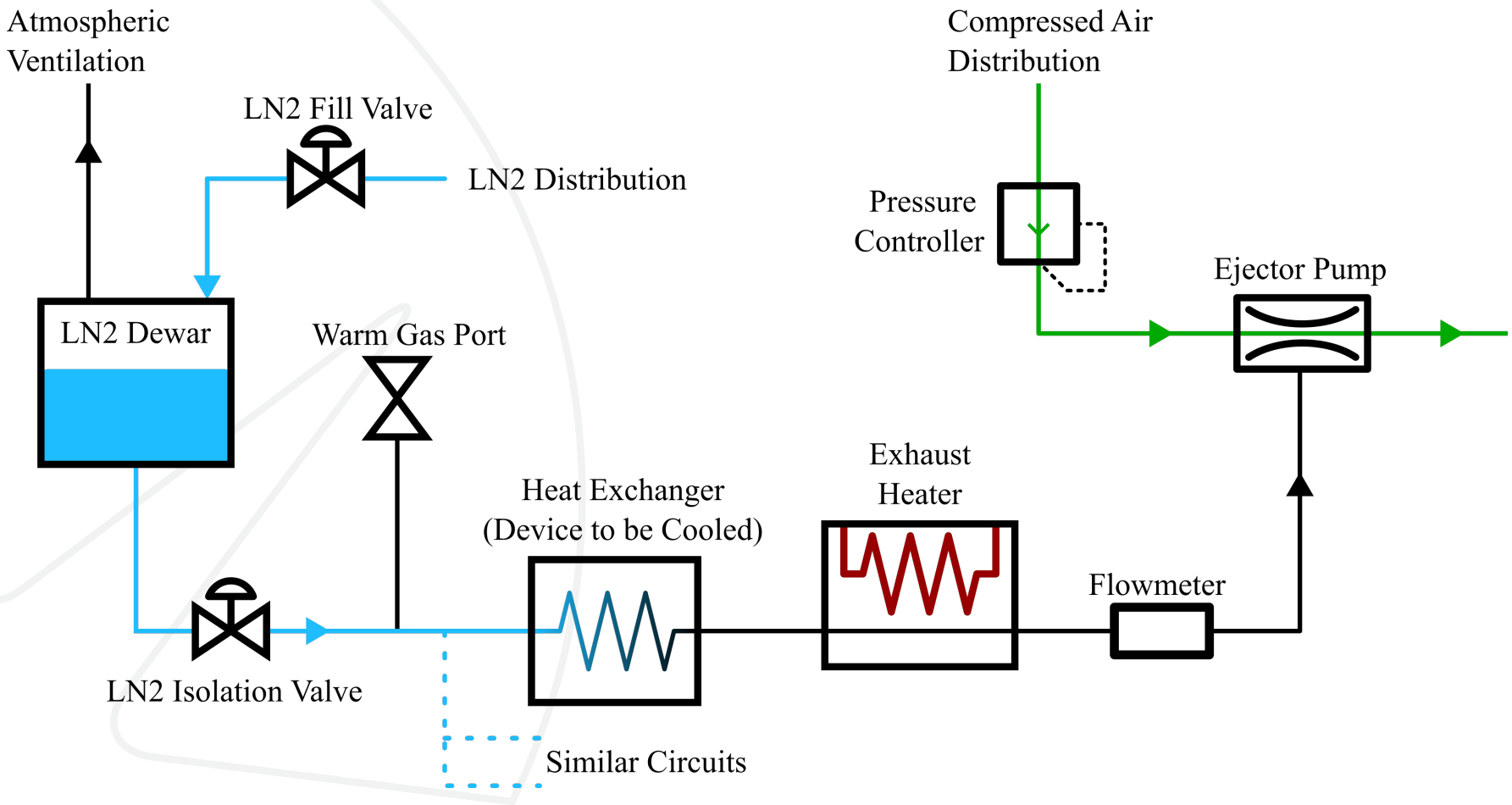
VACCS

Principles of Operation

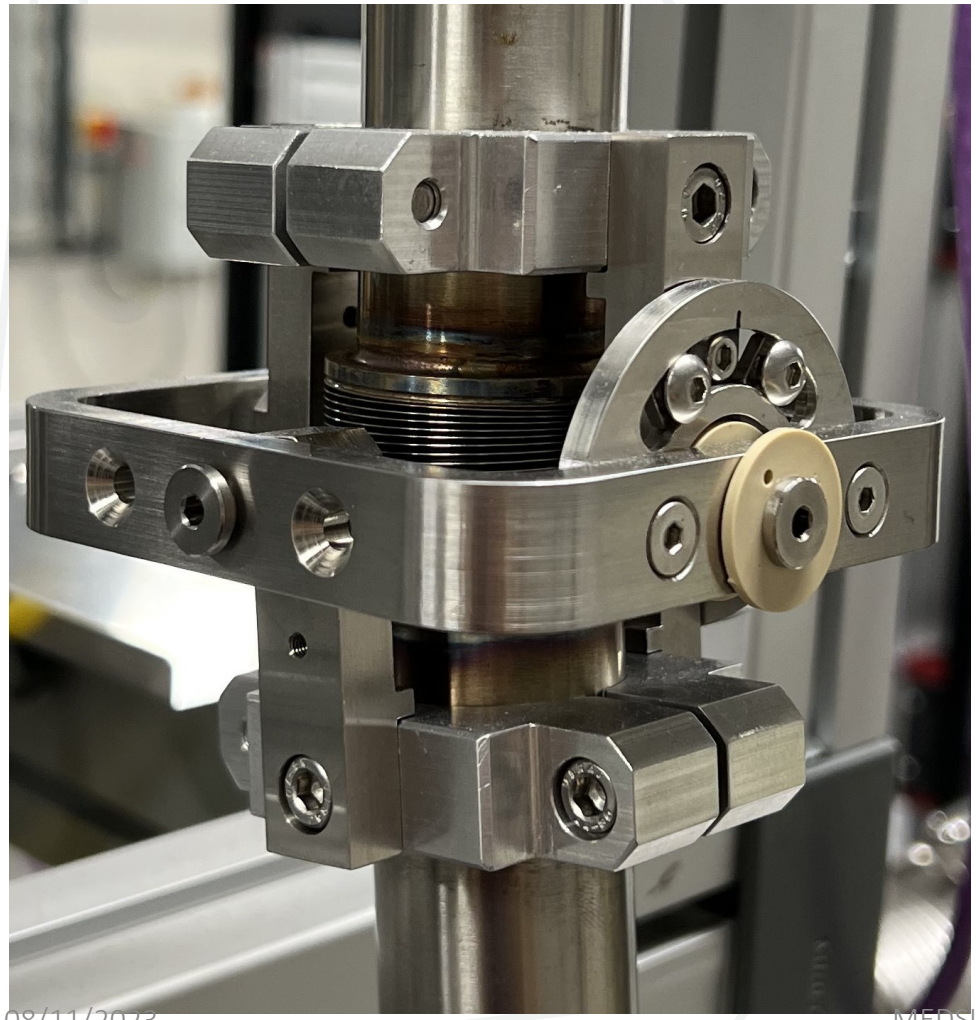


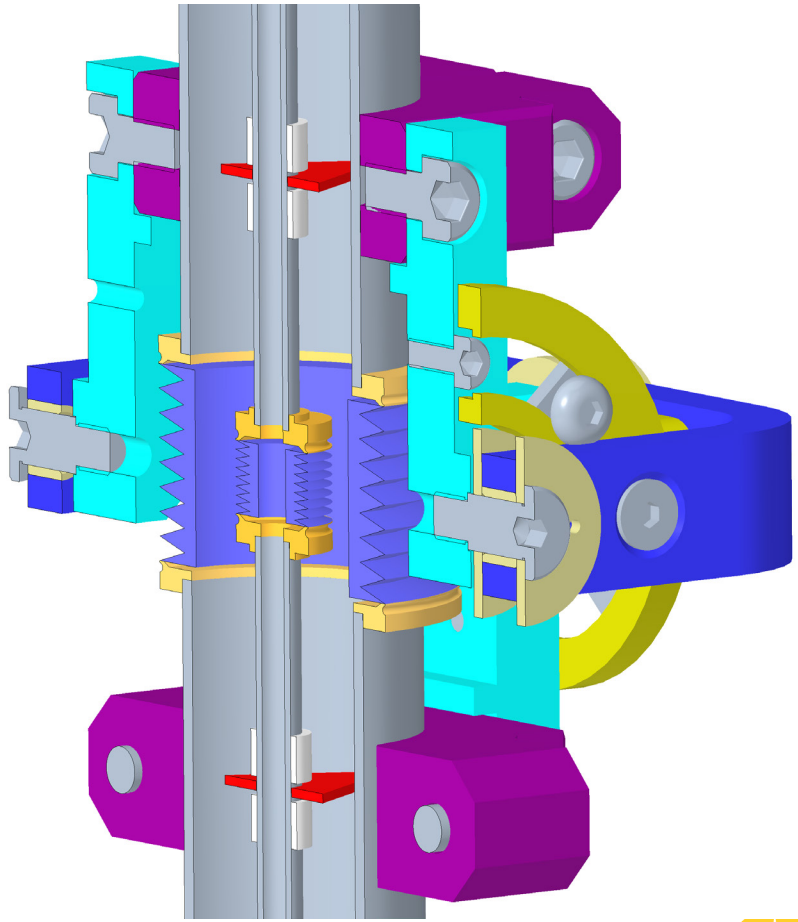


Principles of Operation



Flexible LN2 Lines





Flexible LN2 Lines

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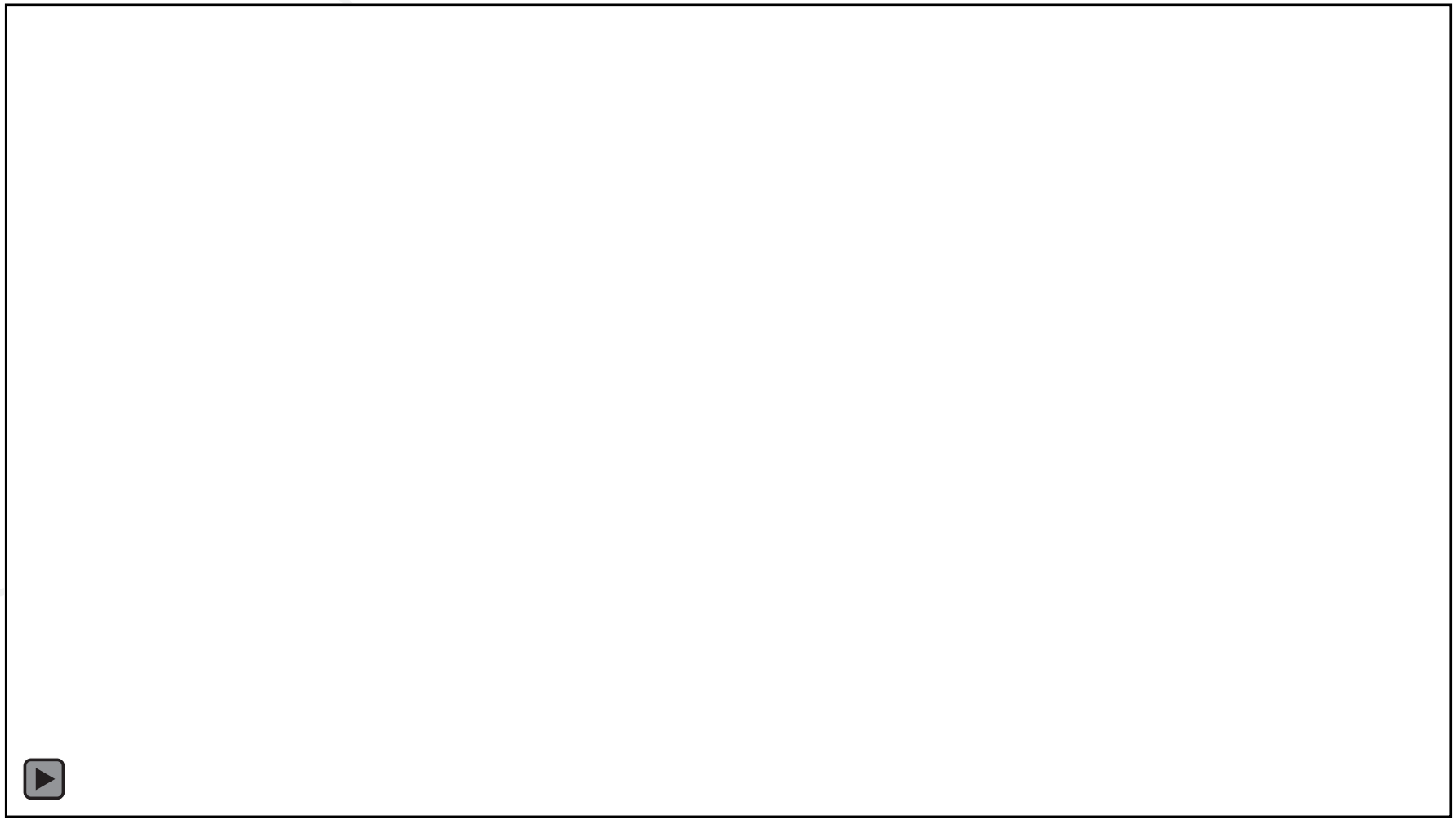
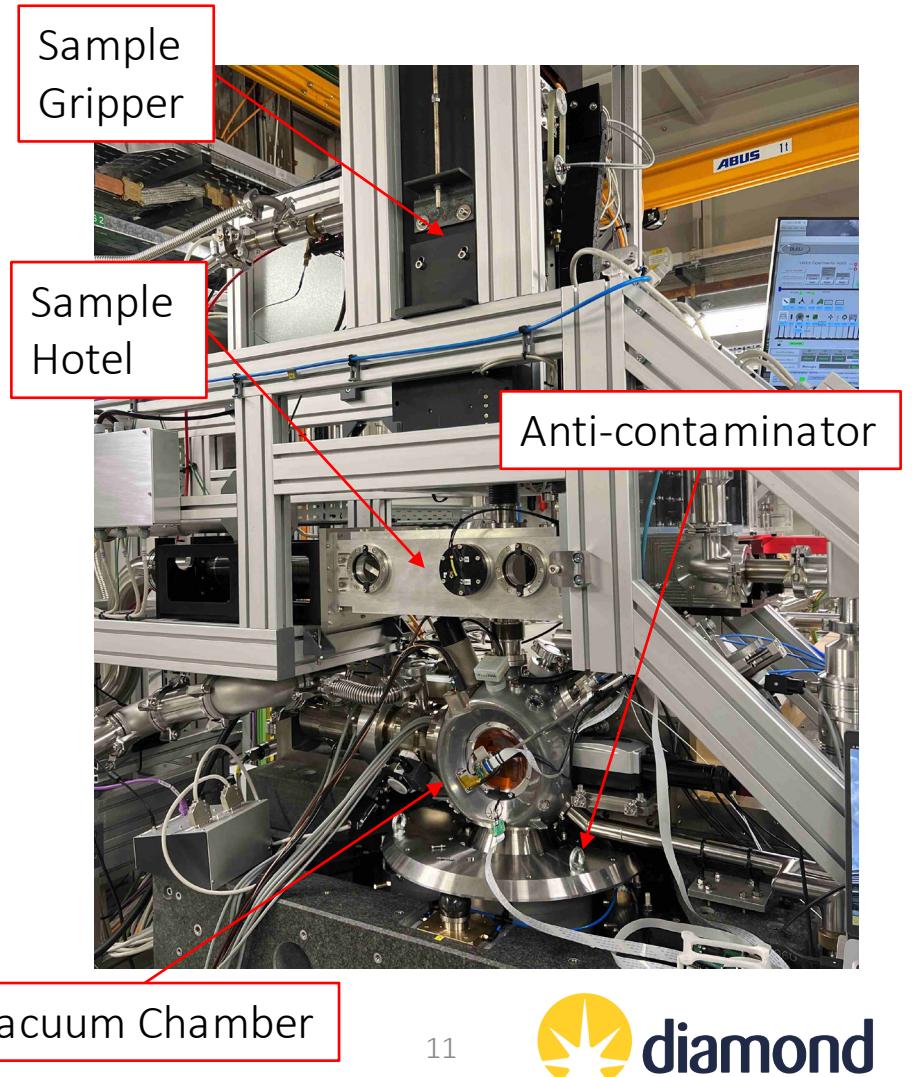


VACCS ON VMXm

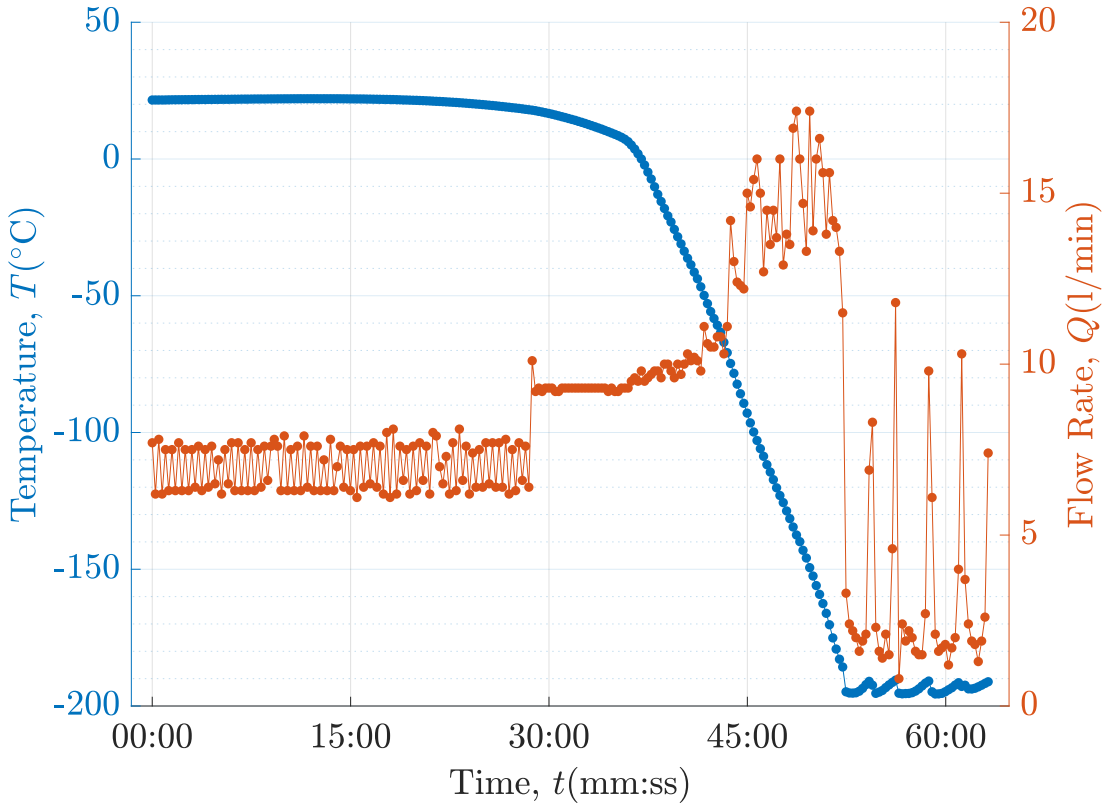
VACCS

Pneumatic Controls

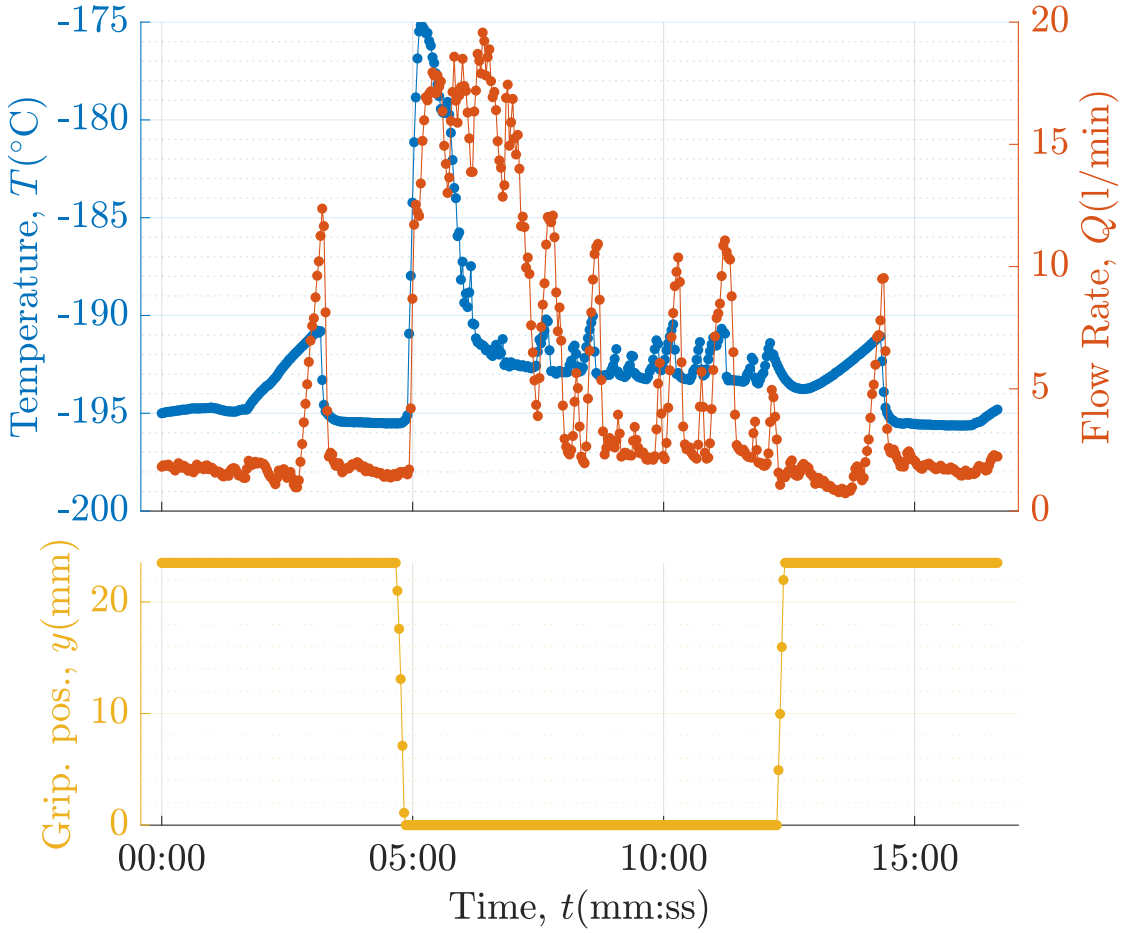


Cooling Performance

Cool down



Cooling a warm sample



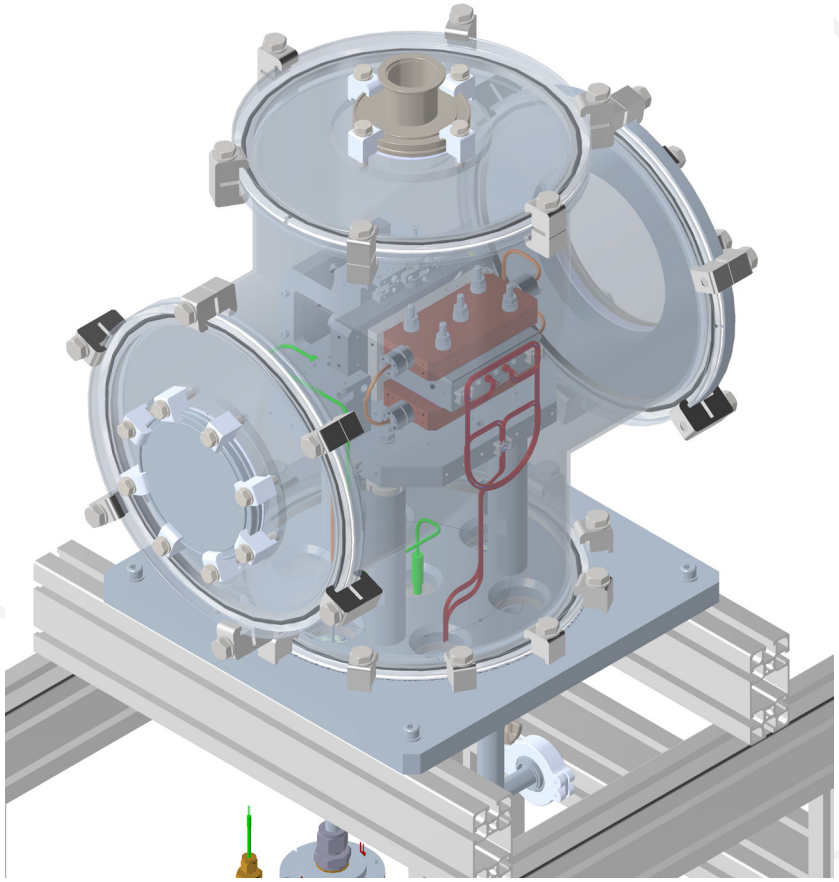
diamond

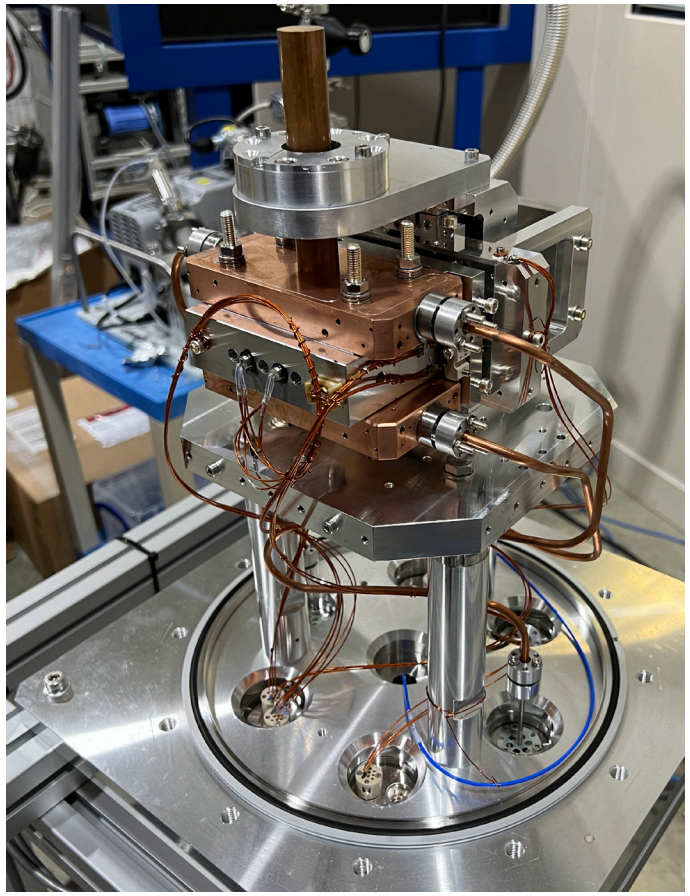
MONOCHROMATOR TEST RIG

VACCS

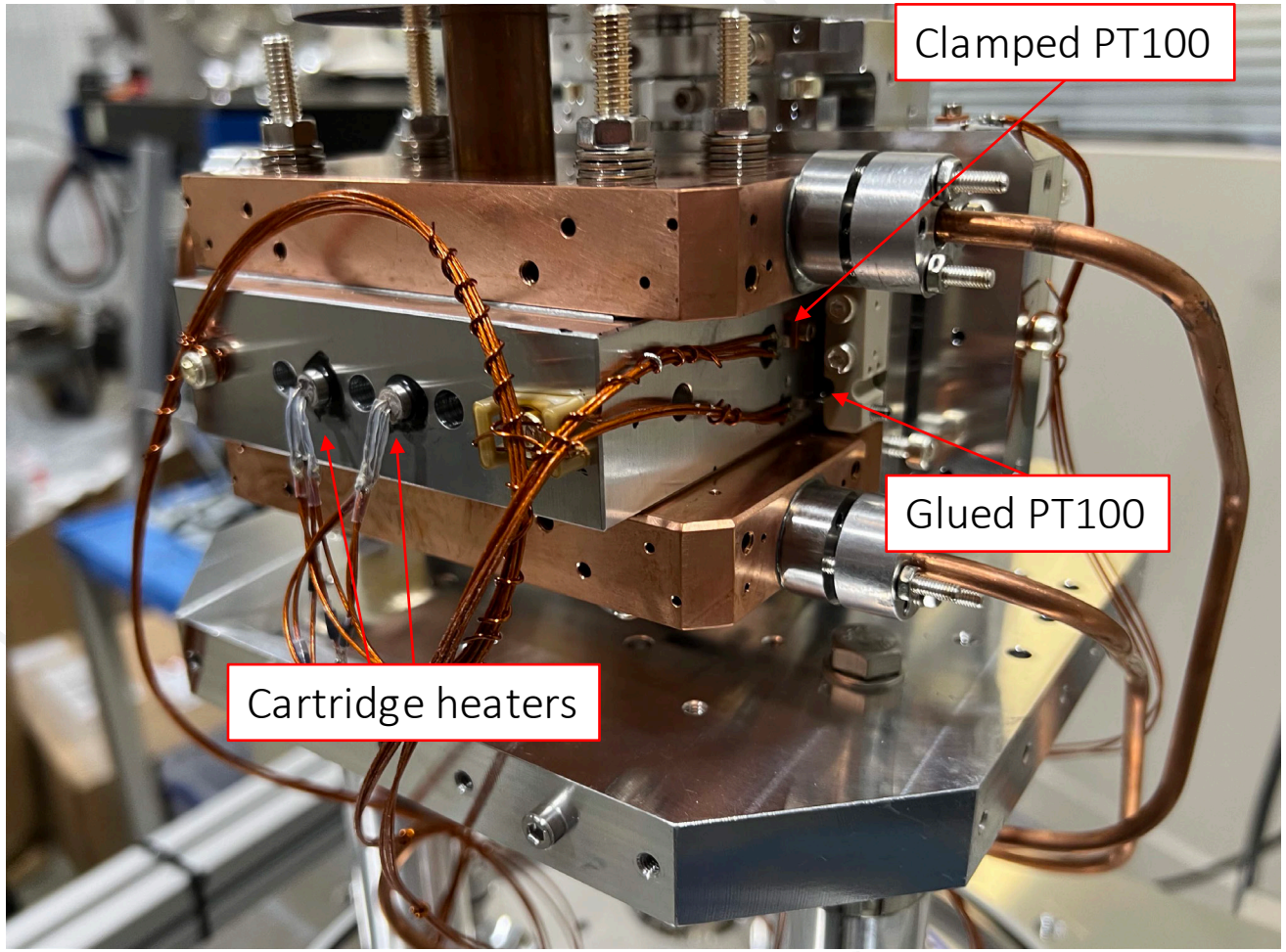
Monochromator Test Rig

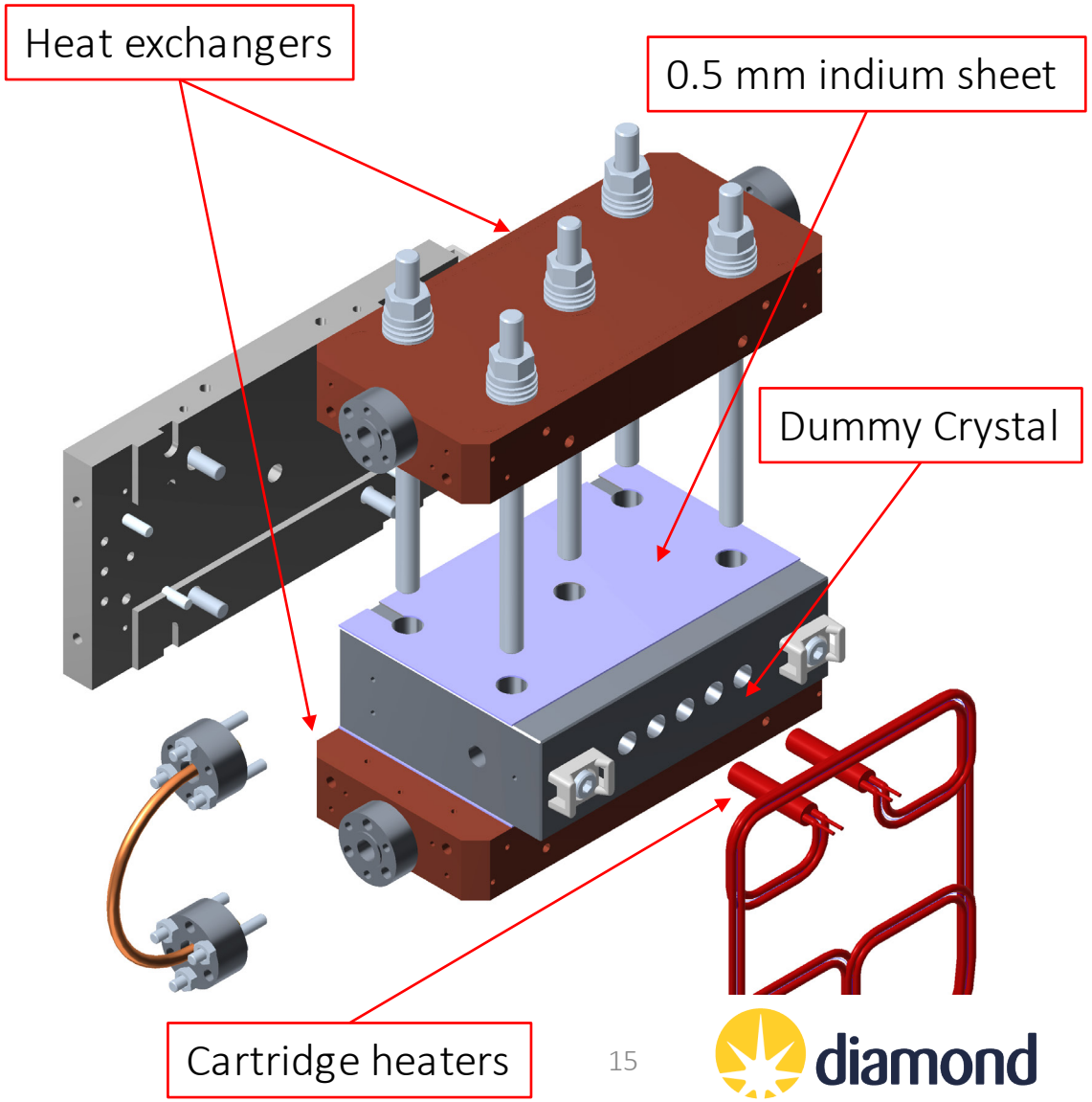
Dummy Crystal:
30(W)x100(L)x70(T) mm



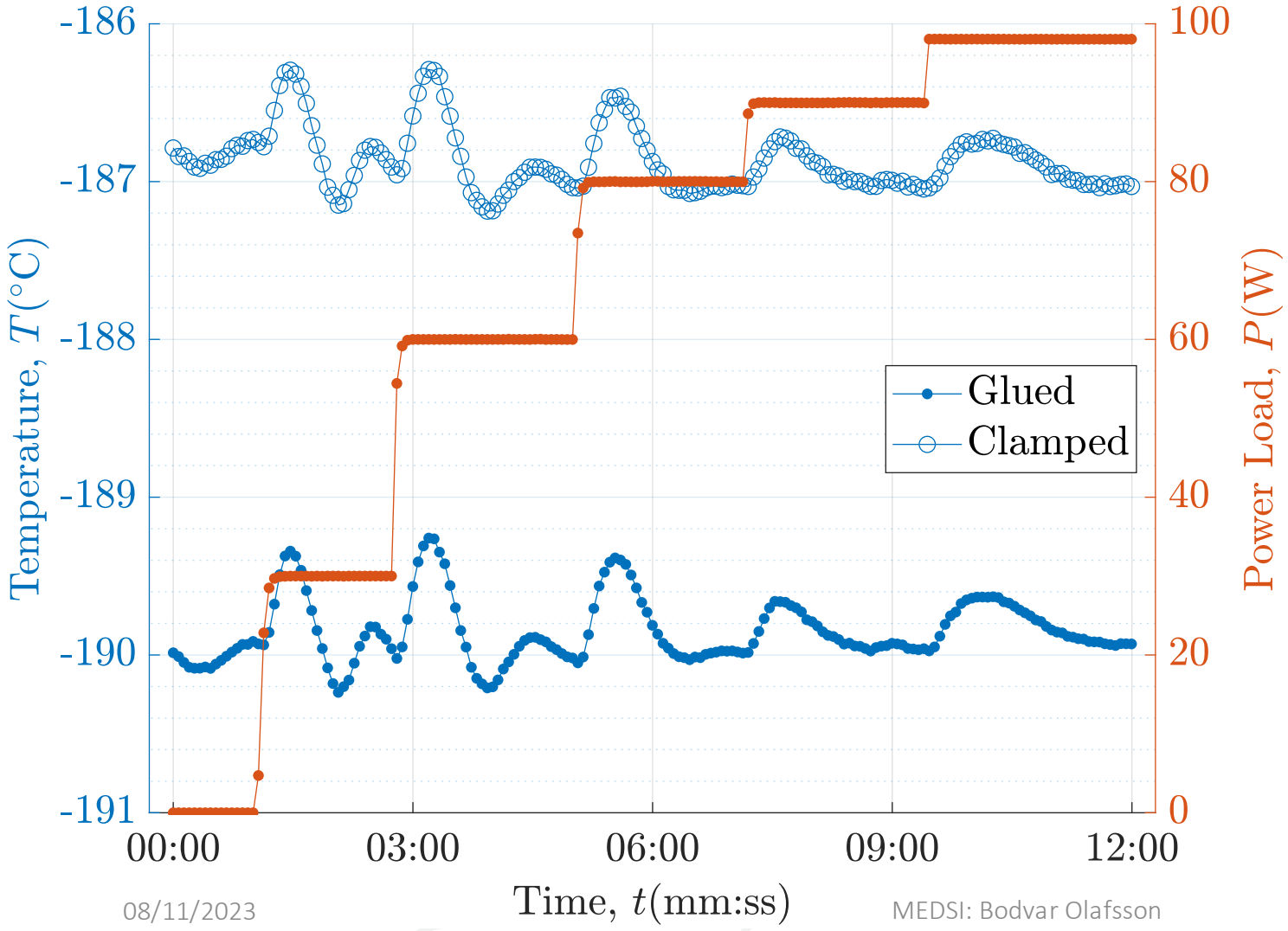


Monochromator Test Rig





Power Load Variation

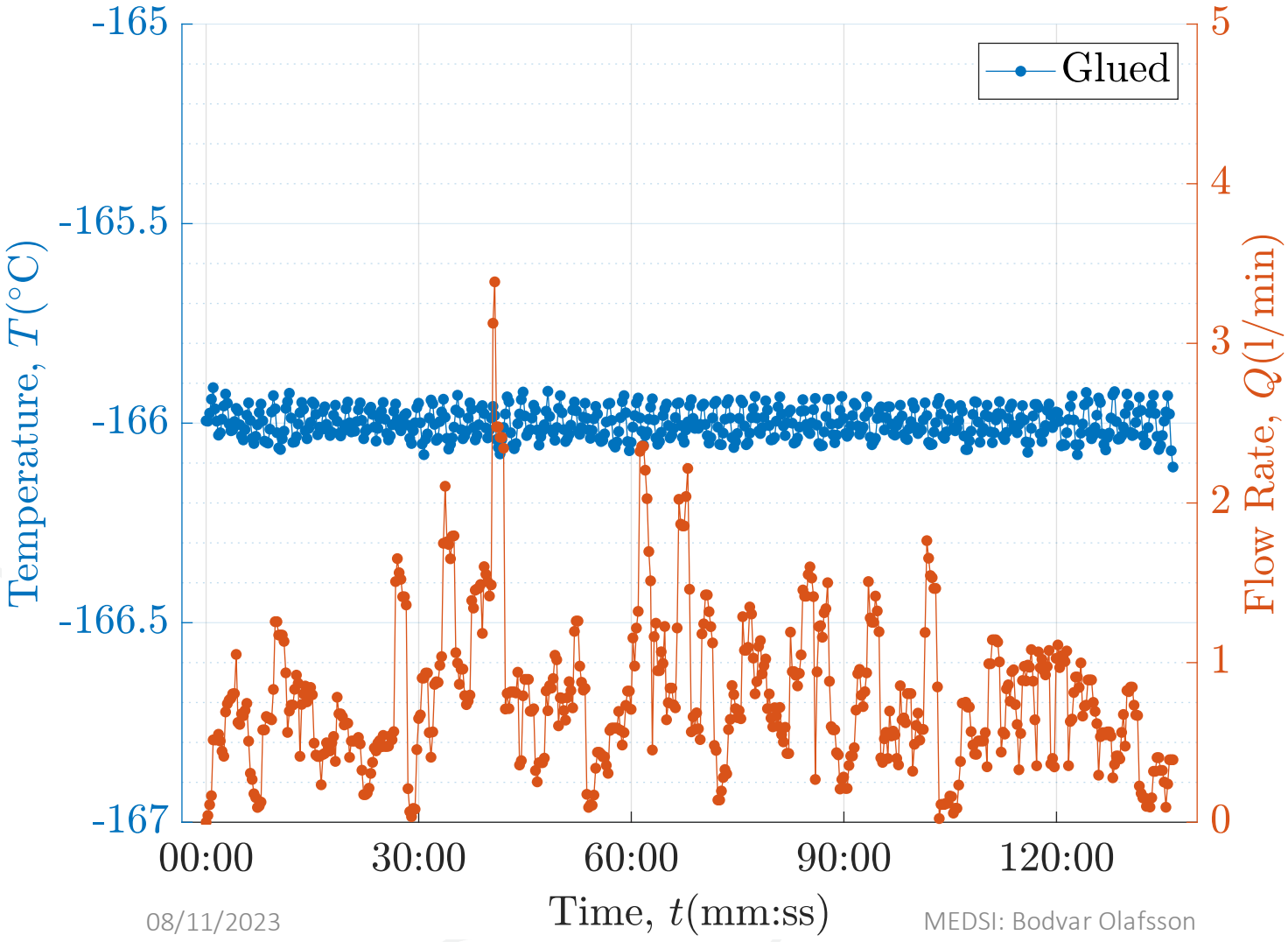


Set temperature = $-190°C$

Statistics:

- $\mu(T_{glued}) = -189.9°C$
- $\sigma(T_{glued}) = 0.2°C$
- $\mu(T_{clamped}) = -186.9°C$
- $\sigma(T_{clamped}) = 0.2°C$

Temperature Stability



Set temperature = $-166°C$

Statistics:

- $\mu(T_{glued}) = -166°C$
- $\sigma(T_{glued}) = 0.038°C$
- $\mu(Q) = -0.789\ l/min$

Thank you for your attention!

Acknowledgement:
Mark Lunnon
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